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EDITORIAL

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Designing digital technologies for sustainable transformations of food systems

ABSTRACT

This Special Issue focuses on exploring the latest trends in the use of information technology to cope with emerging societal transformations on the food system and its interrelations. It aims to be a starting point, especially to show what a key role designers play today in the ongoing transformation process and transition of food systems. It shows that the great challenge of digital innovation in the food sector is to re-design not only the products, but also the services and processes imposed by the ongoing digital transformation.

KEYWORDS

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transition of food
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All over the world, public concern about issues of access to agri-food and food sustainability is increasing as the planet's population grows. Awareness of the real distance between systems of production and consumption is becoming clearer. Food is a vast topic, with a constellation of subtopics, related topics and challenges that designers with different expertise address in different ways (Massari 2017, 2021a). The kaleidoscope of practices today that testify an interest in working on food-related challenges or intentionally aiming to transform food systems has exploded into varied methodological and disciplinary approaches, positioning food beyond a matter of fact and as an issue of concern (Juri et al. 2022; Hill 2015; Stephan 2015; Massari 2021b). The transdisciplinary and creative capabilities of design are playing a critical role in defining and activating these transformations. It becomes critical to discuss the nature of these transformations: where, for/by whom, how and why (Juri et al. 2022; Massari 2021b).

According to the *Global Risks Report 2022* (World Economic Forum 2022), while the main long-term risks relate to climate, the greatest global concerns in the short term are social divisions, livelihood crises and deteriorating mental health. In addition, most experts believe that the global economic recovery will be volatile and uneven over the next three years. As the report notes, health and economic problems are exacerbating social divides, creating tensions at a time when collaboration within individual societies and in the international community will be critical to ensure a faster and more even global recovery. World leaders must join forces and adopt a coordinated multi-stakeholder approach to address persistent global challenges and build resilience ahead of the next crisis. It is not too late, however, for governments and companies to take action on the risks they face and promote an innovative, decisive and inclusive transition that protects economies and populations. Globalization, urbanization and the development of society, are creating new forms of urban experience and contexts of societal transformations where information and communication technologies (ICTs), human-computer interaction (HCI) and different digital communities are the true protagonists of change.

Food is a key element to determine the quality of life and the economy of both industrialized and developing countries, not only because it is a vehicle for food products as economic goods, but mostly because it turns out to be a means of knowledge transformation (Brunori et al. 2022). In the near future, ICTs could play a primary role in the path that defines the cultural and transformational aspects of production, distribution and green and sustainable consumption systems by:

- providing technology that allows a more efficient use of natural resources, regenerative resources and energy;
- increasing the value of ecological footprints through monitoring (with smart and innovative technologies) and the diffusion of transdisciplinary competences and knowledge (at all levels of the supply chain);
- acting as a catalyst for the creation and dissemination of sustainable cultural and business models (more co-participative, cooperative and collaborative);
- allowing the bridging of the information gap between producers and consumers, and allowing access to the decision-making process for all citizens/consumers.

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In addition, Klaus Schwab, German engineer and economist, founder and executive director of the World Economic Forum, identified three common aspects: the speed, scope and impact of technology on systems. He highlights the importance of supporting diverse mindsets to collaborate and work in a transdisciplinary and ecosystemic manner, and he suggests that (1) companies need a better understanding of new technologies to take a broader view and understand what opportunities lurk in less developed areas. Only in this way they can understand what new technologies are capable of doing for a better and healthier world; (2) from the creation of new organizational structures to the implementation of new policies or practices for sustainability, approaches in terms of networks and connections can shape norms and influence the culture and attitude of entire industries throughout the value chain; (3) involving diverse stakeholder groups in finding solutions where negative consequences emerge can help create the inclusive and sustainable future to which we all aspire (Meyer and Schwarze 2021). In this context, an idea of change in food systems is emerging that is increasingly unpredictable, where it is difficult to accurately delineate the future, and where the 'human-centric' role of technology is increasingly clear.

The urgency of the current situation inspires the design of new products, services and systems that can ensure the conversion to pro-healthy and sustainable eating attitudes and behaviours, instead of mere compliance with them. For this reason, design methods can provide strategies that are more engaging and empowering in order to involve as many parties as possible (Massari et al. 2022a). Digital technologies have become vitally important in particular during the present pandemic situation of COVID-19. To slow down the spread of the pandemic, countries around the globe imposed lockdowns and restricted individual movements, which resulted in the concept of 'working, shopping, communicating, doing sports and staying together at a distance' to become the new normal way of living. This has had a clear impact also on the food system of production, distribution, consumption, post-consumption, disposal and their interrelations.

Against this backdrop, this Special Issue focuses on exploring the latest trends in the use of information technology (Marti and Recupero 2021) to cope with emerging societal transformations on the food system and its interrelations. Can we envision ways to use ICTs to actively transform the society as an essential property of long-lasting functioning food systems, and concomitantly view transformation as an effective means of promoting sustainability and social prosperity? The papers included in this Special Issue address, from diverse theoretical and methodological perspectives, this question and report research on some major innovations introduced into the field of agri-food today, and the social and cultural transformations affecting the evolution of the food system. Five original articles and two essays from eminent researchers in the field draw an initial map of areas of transformation in the food system.

In the article entitled 'Green food transformation systems: Role of young people in engagement and digital literacy' the authors Bent Egberg Mikkelsen and Mukti Ram Chapagain (2023) experiment with innovative educational practices (including reflective and hands-on creative activities) to stimulate changes in children's understanding of and attitudes towards food-related practices. The article provides guidance to design educational activities which can be effective and engaging in promoting more sustainable habits. In fact, in a world driven by new technologies, adults have a responsibility to teach

younger people how to live a balanced life. According to a study by the University of Eastern Finland (Kähkönen et al. 2018), food preferences learned in early childhood often accompany a person into adolescence and adulthood. Indeed, a lifestyle programme called SAPERE is in effect in Finnish kindergartens. SAPERE is based on children's natural way of relying on their five senses to learn new things: looking, smelling, tasting, touching and listening. This kind of nutrition education fits perfectly with daily life in kindergartens, where children eat several meals a day and participate in educational group activities. While there are experiments in the literature showing that ICTs can teach a healthy attitude towards a wide range of foods and encourage children to have a diverse and balanced diet, there is an increasing need for guidelines that can be adapted to educational programmes.

Over the last two decades, social media has developed into the main source of information for a huge percentage of the world's population, influencing their opinions, choices and beliefs on every topic imaginable. Indeed, the web network today constitutes one of the main sites of innovation, the cause and consequence of rapid social change. This social change has affected the ways in which people use media to keep in touch, to inform themselves and to communicate with each other and with the outside world. Within this new landscape, the world of food becomes critical, and it is necessary to seamlessly integrate a social media strategy and ensure that it is leveraged as part of a broader digital transformation process. An effective social media strategy can further develop customer loyalty, provide agility and informed citizenship, and achieve broader health and sustainability goals. The article entitled 'Contested definitions of digital agri-food system transformation: A webpage and network analysis' by Alesandros Glaros, Eric Nost, Erin Nelson, Laurens Klerkx and Evan D. G. Fraser (2023), investigates how digital agri-food system transformations are framed in social media discussions. They found three main ways of framing the agri-food transformation: the first one proposes that digital tools make farms optimally productive; the second framing emphasizes inequities in access to digital tools and increased farmer participation in tech development; the third framing highlights how technology creates more traceable agri-food systems. Another article that uses social media is entitled 'The REKO model: Facebook as a platform for food system reconnection' (2023). In this article Sophia Hagolani-Albov and Maria Ehrnström-Fuentes investigate the use of Facebook to transform the food value chain by connecting the producers directly with consumers. The authors refer to the concept of reconnection to analyse the potentialities of this model to address the situational contingencies due to the COVID-19 pandemic, and the need for sustainable local food systems.

'In a complex and liquid society in which transition, complexity, and passing dominate, nothing is long-lasting' wrote Z. Bauman in *Liquid Modernity* (2011: 16) in 2011 to describe the relationship between humans and the digital world. After more than a decade, the changing lifestyle of humans through ICTs is still a key topic of reflection and debate in today's globalized and cosmopolitan society. This Special Issue goes even deeper on digital transformation in the relationship between producers and consumers, discussing how new digital tools can help transform the food system. For example, some cities have started to develop new food strategies, increasing public awareness of a healthier diet richer in fruits and vegetables, inviting mass catering to be sourced through short, organic, local and sustainable supply chains, and finally acting on urban planning and waste prevention and management. In

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'Food markets as circular digital hubs: Prototyping enabling ICT solutions for urban food systems' (2023) Massimo Bianchini and Stefano Maffei discuss the challenges related to the urban food system transformations: the EU funded project presented in the article provides a pilot case to transform the municipal food markets into circularity hubs of local community engagement.

Empowering cities as agents of food system transformation means having cities as agents of change, where food is the design driver. Thus, cities are dynamic places that undergo constant change. They inspire people to develop innovative solutions to the various challenges they face in everyday life. Increased collaboration among different urban stakeholders is crucial to ensuring a liveable space for citizens while improving the quality of their lives. Changing behaviour to adopt healthier lifestyles is a complex process that takes time and determination. Individuals acting alone are unlikely to be able to change food cultures, but they might be able to succeed if they can rely on the support of duly trained local practitioners and innovative ecosystems, supported by local government. Recently, 'Smart Living Labs' and 'Food Hubs' as places that involve high collaboration, for co-learning and co-creating solutions, for transforming food systems and thus fostering healthier and more sustainable food behaviours have taken hold especially in the European Union (Voyteco et al. 2016; Massari et al, 2022b). The European Network of Living Labs (ENoLL), an umbrella organization for living labs around the world, defines them as 'user-centred open innovation ecosystems based on a systematic user co-creation approach, integrating research and innovation processes in real-life communities and settings' (enoll.org). New food systems need to be activated in order to develop a long-lasting food strategy and incentivize collaboration between local governance and have political and social support, the strong involvement of end-users and stakeholders should not be underestimated. Using design methods to restore public trust in food systems, address inequalities, and strengthen food security and resilience at the local scale often means making visible ecosystems that already exist but need to be enhanced and strengthened. In the fifth article 'Transformational design for food systems: Cultural, social and technological challenges' (2023) by Patrizia Marti, Sonia Massari and Annamaria Recupero, the authors discuss the transformational potential of design in the food sector by defining two levels of changes, those that radically change the food system and those enabling changes within a given system. These levels are exemplified with case studies documented in literature and with students' projects showing how transformational design can help grasp the complexity of food and food system transformations; the benefits include tangible and intangible innovation and a broader diversity of innovation. This article provides a special focus on resources of the seas, oceans and for the fish supply chain and its processing industry. Indeed, it argues that in this sector, traditionality must be parallel developed with service and market evolution: design methods can help transform both food behaviours and production and distribution processes.

Human societies (our communities, cities, organizations, etc.) are always in transition. But these transitions have often been unintentional (Dunne and Raby 2013). Transition Design argues that the social transitions we are currently in are headed towards futures we do not necessarily want. But it also argues that we can intentionally shift our transition trajectories towards the futures we want (Escobar 2015; Kossoff 2011). The essay entitled 'Designing for change: Closing the action gap' (2023) by Steven M. Finn in fact provides a perspective on how the current environmental, economic and social issues call

for designing changes across the food value chain, from farm to fork, to innovate the food system, at individual and organizational level. As said before, food is an area undergoing profound transformations, which come alongside major challenges on a global scale such as sustainability, climate change and food poverty. The evolutions in the needs and preferences of consumers, who are increasingly attentive to their own well-being and the environment, as well as the spread of new digital technologies and the paradigms of Agriculture and Industry 4.0 require us to rethink how we operate, the ways of collaborating within and outside the sector, and the relationship with the end customer. But it is not just that. Think of personalized nutrition and eating experience, including sensory personalization of food, which are in fact meeting new lifestyles and placing the well-being of the individual and the environment at the centre, while sustainability is increasingly relying on technologies peculiar to Industry 4.0, which are able to optimize processes and rethink ecosystem models of food. Marianna Obrist in her essay 'Reflection on the design of food systems and experiences for sustainable transformations' (2023) discusses some transformations of the eating experience through innovative technologies and multisensory stimulations. She reviews recent research on enhanced food experiences enabled by novel technologies which have the potential to transform/enrich the human sensory experiences. The essay also offers a reflection upon the implications of such developments and their long-term impact and sustainability.

We are aware that many of the themes related to digital transformation in food systems are missing from this Special Issue (just to mention a few: food habits and Artificial Intelligence, new era of digital biology, new forms of energy and innovative proteins, digital approaches in eating design scenarios, transformation processes in production, starting with agriculture and livestock, innovative tools and strategies for assessing and providing food safety ...).

However, this Special Issue aims to be a starting point, especially to show what a key role designers play today in the ongoing transformation process and transition of food systems. It shows that the great challenge of digital innovation in the food sector is to re-design not only the products, but also the services and processes imposed by the ongoing digital transformation. In fact, it is now acknowledged that all the realities affected by this change need a structural rethinking that is in line with digital logic and also challenges their mindset in the market. A challenge that calls both companies, but also governances (local and global) to a structural renewal, able to face the ongoing transformations, use new products and services, and regenerate the sectors of production; that is, activate a conscious and lasting innovation.

This Special Issue introduces different scenarios, where theory of change (Taplin et al. 2013) and transition design equally contribute to the digital transformation of new and innovative agri-food systems. It identifies a multidisciplinary landscape on the vivid and variegated research on transformations of the food system including education and social media studies, and the design of local and more sustainable food systems. As designers, innovators and creatives actively working to positively transform the world of food, we should ask ourselves and dialogue with other disciplines to find the answers. How can our innovations change food cultures for the better, both directly and across disciplines? What do food ecosystems need that design methods can give?

The novelty of the Special Issue lies in addressing matters from a trans-disciplinary perspective, looking at the food system transformation as a

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complex and articulated effort involving different stakeholders, from producers of food who should get an equal say in decision making processes concerning the food system, to policy-makers who can actuate policies for sustainable changes. Opportunities for connection and the increase of performance and communication can provide the foundation for the creation of new and unimaginable food cultures (Massari 2021b). The research has the role to ease the process by proposing new approaches to education, communication, design and technology development that benefit people, especially those at the beginning of the value chains.

What knowledge and skills do designers need to acquire in order to design transformative, healthier and more sustainable, resilient and impactful food systems? The articles included here highlight how important it is for a designer to know, understand and be able to speak the language of food with the different actors in the supply chain (including the end-user consumer), in order to activate an impact, a real change. They also confirm that digital transformation in agribusiness is not just about buying the latest technologies, but it is about building a shared culture.

Food needs design and design needs food. Why and how can digital transformation enhance and strengthen these dynamics? Will a human-centric approach drive the future of food capable of placing people at the centre of all transformations? Incentivizing transformation requires new skills in climate change, sustainable development and ecological transition; educating about the complexity of today's world requires preparing end-users to be protagonists of individual and collective transformation pathways in their community contexts, facilitating knowledge by valuing natural resources as collective assets, and finding collaborative solutions. Nowadays as in the near future, inevitably, people and digital technologies will interact to build something new, perhaps like never before. New monitoring and evaluation criteria will provide additional support for transformative food projects design.

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